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Australia's Future Rests on Water

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Maps: Scratches on Clay to Precision on Paper

"TAKE A BREAK!" SHOUT AUSTRALIAN COWBOYS—This Eucalyptus-Shaded River Marks a Vital Watering Place on a Dusty Cattle Drive Through the Dry "Outback"

37 AUSTRALIAN NATIONAL PUBLICITY ASSOCIATION

the geographical problem that limits the growth of Australia's people.

Blistering hot Australian desert regions lie interminably flat—stretches of cracked, baked earth, ridged with sand, sometimes flecked with spinifex or scrub growth, sometimes punctuated by abrupt, barren rock formations. Water exists under the surface of many such regions. In 1907 a cattleman laid out a cattle trail across 500 miles of desolate desert, yet sunk some 50 good wells. On the average, he only had to bore about 36 feet before striking water. Desert wells are usually too salty and too limited to nourish crops.

East of the riverless wastes come sparse lands where streams occasionally flow and cattle can find some grazing. Then a broad, fertile belt sweeps from tropical jungles surrounding the Gulf of Carpentaria to the cool sheep country of Victoria and South Australia. There far-flung stations (ranches) raise money-making wool, wheat, beef.

For years Australians have pondered ways to increase the size of this prosperous slice of land. It contains Australia's only notable river basin, the Murray-Darling system, stretching 2,310 miles from Queensland's mountains to Victoria, then west to the South Australian coast.

In 1886, George Chaffey, Canadian engineer, came to Australia and, with his brother, turned his hand to irrigating neglected land within the Murray Basin. Dusty sheep towns suddenly blossomed with orchards. Irrigation projects now abound in Australia. Hume Dam, completed in 1936, traps one of the world's largest reservoirs, enough, it is hoped, to keep the Murray flowing for two years of drought—when ordinarily

BLEACHED LIKE A SKELETON, a Bone-Dry Queensland River Winds to the Coral Sea

UMI

HOWELL WALKER, NATIONAL GEOGRAPHIC STAFF

PIPELINE TO POWER—From High in the Snowy Mountains Water Will Flow Through Tunnels and Pipes Like This to Feed Power Stations and Irrigate Inland Valleys

Australia's Future Rests on Water

Americans can easily picture broad, sunny Australia because its area is almost exactly the same as that of continental United States. It comes so close that if South Dakota were carved out of our midwest, Australia would be bigger.

To complete the picture, pretend that the people in New York City, plus the residents of Baltimore, were sprinkled over a United States otherwise empty of human beings. The result: a true view of Australia —immense in area, tiny in population (it's about 9,000,000).

Ambitious Australians would like nothing better than to boost their population. But facing them is a huge, elementary problem—lack of water. One third of their continent is occupied by deserts. Their combined area is second only to the Sahara in size.

Suppose a vast, irregular tract of sandy wasteland, where not one river flowed, extended from Columbus, Ohio, to Denver and from the Gulf of Mexico to Minneapolis. Americans, then, would know firsthand

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St. Helena Redeems Napoleon's Last Retreat

Far from Austerlitz, far from Waterloo, this lonely house of exile on St. Helena Island today stands reclaimed as a memorial to its famous prisoner, Napoleon Bonaparte.

Infrequent visitors to the wind-swept volcanic isle in the South Atlantic used to find Longwood House empty, locked, decaying. Now the low, T-shaped, pink dwelling has been redeemed from ruin. Inside are furniture and articles used by the French emperor.

Today's travelers examine the billiard table where Napoleon spread his maps, two globes that bear marks of his fingernails, and a wooden, lead-lined bath where he spent hours dictating his memoirs.

British-owned St. Helena looms from the sea like a great black fortress, 1,000 miles south of the Equator and 1,200 miles west of Africa. When a man-of-war anchored off the isle in October, 1815, the "little Corporal" observed glumly, "This is no holiday resort."

Napoleon lived most of his exile in two sparsely furnished rooms and a pleasant garden with cypress trees and hedges. He slept on a camp bed. But he demanded palace-style protocol. Boredom nagged him. There were few diversions on the 10-by-6-mile island.

Stomach trouble plagued Bonaparte; he died at 52 on May 5, 1821, with the word "France" on his lips, according to tradition.

With his passing, Longwood House seemed to die, too. Queen Victoria gave house and grounds to France. Restoration was started, then abandoned for lack of funds. Friends of St. Helena, organized in 1931, repaired it. Then damage from termites required a second restoration.

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IRRIGATION GREENS MURRAY VALLEY—Like Swift Couriers from the Mountains, Brimful Ditches Course Through Orchardlands with a Message of Water for Every Tree

even this stream would dry up. The vast Snowy River project, scheduled to take 30 more years before completion, will divert water from the eastern slopes of a section of the Great Dividing Range. After passing through power stations it will irrigate grazing and crop lands west of the mountains.

But there can be no irrigation without water—and water is almost entirely lacking in the blazing deserts that give the term "dead heart" to central Australia.

Some years ago an engineer, J. J. Bradfield, suggested diverting some eastern streams so that they would empty into the usually dry, salt-caked bed of Lake Eyre, twice the size of Great Salt Lake, Utah. Ringed by desert, Lake Eyre's bottom lies 39 feet below sea level. Bradfield theorized that if it were constantly filled it would feed irrigation ditches and possibly add rain-making moisture to the air.

In the Australian summer of 1949-50, torrential rains actually filled this lake. Two cattlemen boated down the turbulent flood that flowed through what had been a dry wash. The seething stream carried them onto the tossing waters of a wind-swept inland sea, some 13 feet deep.

Within two years Lake Eyre had nearly evaporated. But its flooding revived interest in the Bradfield Plan, reminding Australians that in this atomic age their deserts might bloom again as did Lake Eyre's shores in primordial times. It all depends on water.

National Geographic References: ***Map***—Australia (paper 50¢; fabric $1)

Magazine—March, 1948, "The Society Maps a New Australia," (includes above map, 75¢); Dec., 1936, "Beyond Australia's Cities," ($1)

School Bulletins—Mar. 28, '55, "Flying Doctors Serve Australia's Outback," (10¢) Oct. 23, '50, "News from Australia—Lake Eyre Full of Water," (out of print)

to him in Africa, is familiar around the world.

The clawing wrestlers (left) could be twins, the black being a melano, or "black sheep" of the family. Black or spotted, the leopard *(Felis pardus)* is fiercest of felines.

The future looks grim for the black antelope (lower right). Once a cheetah selects its prey, it's usually only a short race before dinnertime. Hitting as much as 70 miles an hour, this fleet "hunting leopard" is the fastest sprinter afoot.

Bengal tiger, lord of India's jungles (lowest), pounces, claws extended, on a blue nilgai, an antelope larger than himself. This striped cat attacks humans only when unable to obtain natural prey.

The cat family also includes the Siberian tiger, snow leopard, clouded leopard, marbled cat, golden cat, jaguar, jaguarundi, ocelot, lynx, serval, tiger cat, Pallas's cat, African wildcat, and European wildcat. All these, plus the ones pictured here, and not overlooking the common house cat, are presented in full natural color in Walter A. Weber's 20 brilliant paintings, National Geographic Magazine, February, 1943, $1. A complete biography of the species accompanies each painting.

Cats at Home and Abroad

With Illustrations from Paintings by National Geographic Artist Walter A. Weber

They're all cats, wherever they live, however their coats are marked. The puma *(Felis concolor,* above), America's version of the lion, is variously labeled panther, catamount, and mountain lion. She is at home anywhere from Canada's Peace River to the bleak Strait of Magellan, though now rarely found in eastern United States. Playful cubs, unlike the indelibly marked leopard of legend, change their spots. These fade out as cubs mature, leaving their coats the same spotless tan as mother's.

Stubby tail gives bobcat (left) his name. A night hunter, Bob claws swiftly up a tree branch to grab a spruce grouse.

Cousin *Felis leo* (left) boasts an impressive mane. His mate is unadorned. Leo lives most numerously and happily in Africa; is occasionally found in Iran. His blood-curdling roar once resounded in India's jungles but few lions now remain in that Asian republic. India is taking steps to lure him back (School Bulletins, March 21, 1955).

Huge and tawny, the lion loves to bask with regal laziness through the hot hours of the day. His fierce courage earns him his traditional title: King of Beasts. He has become a symbol for many nations. Even the Swahili name, Simba, applied to him in Africa, is familiar around the world.

South of this rich and arid region lie the Vales of Paradise, land of the big cities and the *fundos*. Santiago, the capital, displays Spanish charm, complex politics, and a mixture of modern architecture and relics of the conquistadors. Valparaíso, international in spirit, leads all South American Pacific ports, is bustling and up-to-date. New industries thriving in the cities include textile mills and factories producing leather goods, glass, cement, and other domestic necessities.

Over plains and ridges spread the fundos. These are huge estates, many owned by descendants of the original titleholders to whom the Spanish Crown granted them four centuries ago.

W. ROBERT MOORE, NATIONAL GEOGRAPHIC STAFF

A NAVAL HERO GUARDS VALPARAÍSO—Beyond Admiral Prat's Statue Rise the Port's Twin-Towered Customhouse, left, and Railway Station

The fertile valleys between Andes and coast range are Chile's garden spot. Swift mountain streams bring irrigation water to take over when the rains stop. This assured moisture supply produces luxuriant crops of almost every fruit, grain, and vegetable that will grow anywhere. In a climate like California's, cherries and apples flourish along with citrus fruits; vineyards give grapes for Chile's fine wines.

South of the Vales lies Chile's prize tourist lure—the lake district. Here fantastic volcanoes, happily extinct, reflect sharp outlines in azure waters of forested lakes. Fishing and hunting attract throngs.

The mountains and wooded ravines of this scenic wonderland recalled their European homeland to immigrants from Austria, Germany, and Switzerland who, more than a century ago, settled the wilderness at the invitation of the Chilean government. Their descendants remain a prosperous foreign island, clinging to European ways in wooden houses like Old World mountain chalets.

In dank meadows of the southern provinces graze millions of sheep, far outnumbering the human population which could not exist without their wool and mutton.

FENNO JACOBS FROM THREE LIONS

CHILEAN HORSEMEN LOVE RODEOS—Scorning the Bull Ring of Neighbor Countries, *Huasos* Show Skill at Riding, Herding

W. H. EAGLE

GRAIN RIPENS ON CHILE'S COASTAL FARMS—White-Capped Osorno Volcano Looks down on Norwegianlike Seascape near Puerto Montt Where North Europeans Settled

From Minerals and Mutton Comes Chile's Wealth

Summer is coming to Chile—that is, to central Chile, where four-fifths of the nation's 6,000,000 people live. As North Americans enjoy fall foliage, Chileans in the "Vales of Paradise" unpack bathing suits.

However, so mountainous is the elongated republic that there is always winter at some point within its borders. The Andes, nature's wall fencing off Argentina on the east, are forever snow-frosted. Except for central Asian ranges, they are the world's highest mountains.

Chile is a land of dramatic contrasts. From the arid north of copper-lined mountains and endless nitrate fields, to the rain-drenched sheep pastures of the south, climates run the gamut from torrid to polar, products range from gold to mutton.

Geographically Chile falls into three definite divisions—north "where it never rains," center "where it rains in winter," south "where it rains all the time." The Atacama Desert may well be earth's driest spot, yet this barren northern plateau is the source of Chile's chief wealth. Nitrates which once supplied all the world's fertilizer encrust it. When Germany developed synthetic nitrates during World War I, Chile fell into an abysmal depression. But gradually the South American country benefited as other industries arose. Now Chilean nitrates again bring in cash though they furnish only eight percent of the world's nitrate supply.

Today copper is king. Though Chile is second to the United States in production, its Chuquicamata mine is the world's largest. Northern ports—Arica, Antofagasta, San Antonio—ship copper, chiefly to the United States whose appetite for it exceeds its own supply.

commander of an American naval vessel in the South Seas gave a piece of chalk to a native visitor and asked for general information about the area. The man quickly sketched a map on the deck showing many islands in their relative positions and distances from each other, though it appeared that some were hundreds of miles apart. Later the skeptical commander was amazed at the accuracy of this map drawn from memory.

Mapping large areas—entire countries, or the world itself—depends on understanding the shape and size of the world. In Columbus's time, of course, many sailors knew the world was round because they had seen the sails of distant ships peeking above the horizon while their hulls hid behind the earth's curve. Ancient Greeks understood the earth's true shape and in 250 B.C. an Alexandrian named Eratosthenes calculated its circumference with astonishing accuracy.

If it were possible to get into a powerful helicopter and go straight up, watching the earth below, it would be easy to see how a map can be made. Confusing details of individual trees, bushes, rows of planted corn, blend into soft, general masses of green. Sparkling lakes and streams, and the distinct lines of roads stand out. Towns show in relation to each other.

To transfer these landmarks to paper, the map maker must use a grid of intersecting lines on which to pinpoint them. These are the lines of latitude, parallel to the Equator, and the lines of longitude which meet at the poles. Choosing the starting point for these meridians of longitude caused considerable haggling among nations. France wanted longitude zero to pass through Paris. Spain demanded Madrid, the United States held out for Washington or Philadelphia. Great Britain won. The

THE PAPER IS FLAT, BUT MOUNTAINS SEEM TO RISE—A Draftsman in The Society Studios Applies Hachures—a Three Month's Job Demanding 2,000,000 Pen Strokes

NATIONAL GEOGRAPHIC PHOTOGRAPHER VOLKMAR WENTZEL

UMI

FLATTENING OUT NORTH AMERICA FOR A NATIONAL GEOGRAPHIC SOCIETY MAP
Globular extent of the area selected for projection into flat map
Center
This is but one of several ways to do it
Cut this an infinite number of times all round to the Center [pole of projection] and we get, when pressed out flat,
EXPANSION
AN EXAMPLE OF THE AZIMUTHAL EQUIDISTANT PROJECTION
TOO LARGE
TOO LARGE
TOO LARGE
TOO LARGE
LINES THROUGH THE CENTER STRAIGHT
SCALE CORRECT ON ALL STRAIGHT LINES
Center

Maps: Scratches on Clay to Precision on Paper

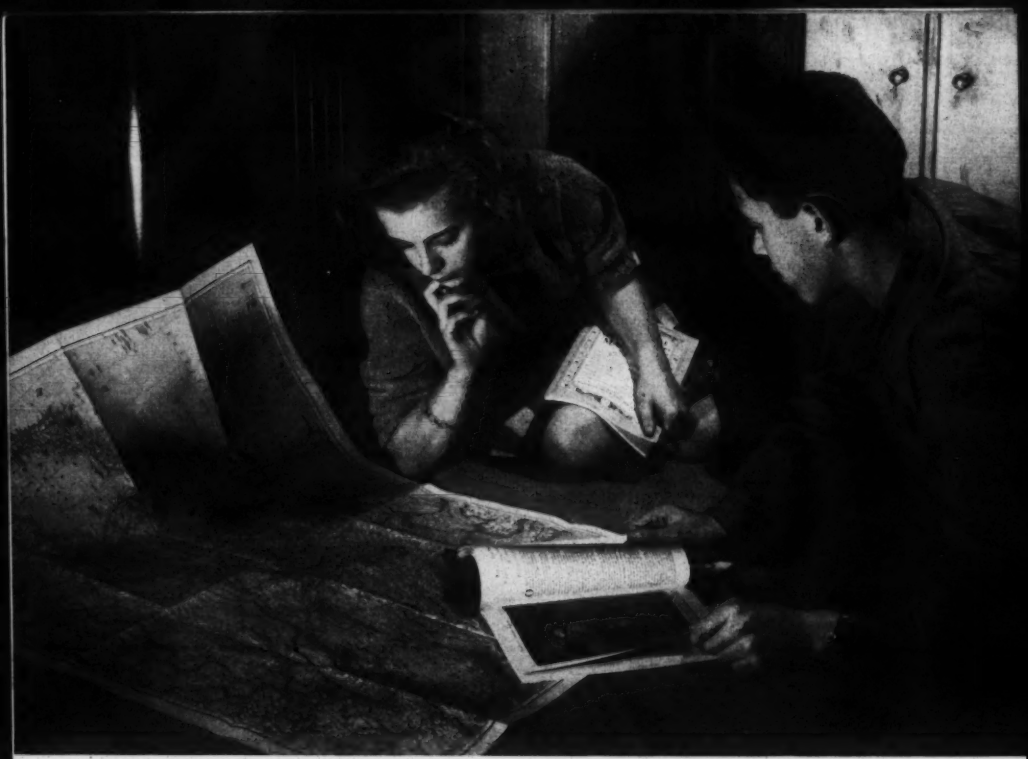
Everybody uses maps in some form at some time. Without them travelers would all become explorers, setting out in the general direction of whatever place they wish to visit, not knowing the best way to get there, how far away it is, or just where they are at any point along the way.

Maps date back to man's first attempts at communication. Earliest-known map is a Babylonian clay tablet dating from 2500 B.C. It carries a sketch of what is thought to be the Euphrates Valley. Eskimo hunters, African natives, even modern householders make similar sketches on walrus skin, dirt, or expensive stationery when directing friends to distant hunting grounds, tribal dance location, or a dinner party.

"Mental mappers" are often remarkably observant and accurate. More than a hundred years ago the

THE ROUND EARTH ON FLAT PAPER

—Map-making Would Be No Problem if the Earth Were Flat. This Diagram Shows One Method of "Projecting" a Curved Surface onto Flat Paper. It's Easy to See That, When Pressed Flat, This Section of the Globe Will Spread Around the Edges. This Has the Effect of Enlarging Land and Water Areas near the Borders of the Map, but Keeps a Correct Scale on all Straight Lines Through the Center. Other Projections Solve the Problem in Different Ways



NATIONAL GEOGRAPHIC PHOTOGRAPHER WILLARD R. CULVER

LARGE-AREA MAPS Help Students Understand All Factors Influencing Current Events

prime meridian slices the southeastern London district of Greenwich.

To map the entire world, or a single country, the same principles apply. The only difference is in "scale." A county map could be on a scale of one inch on paper equaling one mile on the ground, but a world map would require something like one inch on paper to equal 632 miles on the ground. The various projections—Transverse Mercator, Azimuthal Equidistant, Polyconic, Chamberlin Trimetric, and others—are ways of portraying the globe's round surface on flat paper.

We use many different kinds of maps in daily life. Most common is the road map, showing location of various cities and towns and the roads that join them. Political maps play up national boundaries. Topographic or contour maps emphasize such natural features as high and low points, rivers and lakes. Forest, soil, and crop maps mark stands of timber, kinds of soil, varieties of crops, and dozens of others give specialized information. Even the rural mail carrier has route maps.

By using colors, shadings, various type faces, and special symbols, most general maps combine the more important features of specialized maps. The 51 ten-color wall maps on the current National Geographic Society list are mostly of this general all-purpose type. Each can be read as easily as a book. And each gives the whole story on one single page.

National Geographic References: ***Special Book***—The Round Earth on Flat Paper (75¢) ***Map List*** (free) describes The Society's currently available 10-color wall maps, giving scales, dimensions and area covered, and subject matter included. Individual standard map price: paper, 50¢; fabric, $1; nine specially enlarged maps on heavy chart paper, $2 each.